IN THE CLAIMS

Please cancel claims 1-13, 21 and 26-35 without prejudice or disclaimer, and amend claims 14, 17, 22, 24, 25, 36 and 39 as follows:

Claims 1-13 (Canceled)

14. (Currently Amended) An approximation system for a series expansion of an input function with a finite number of terms N to minimize an approximation error, said system including an operational processing unit, said operational processing unit comprising:

means for expanding ~~an operational processing unit which expands~~ the input function in Taylor series up to an (N-1)-th term to obtain a first expansion result;~~,~~ ~~expands~~

means for expanding the input function in Taylor series up to an N-th term to obtain a second expansion result;~~, multiplies~~

means for multiplying the first expansion result by a predetermined weight α to obtain a multiplication result;~~, combines~~

means for combining the multiplication result and the second expansion result to obtain a combined result;[[,]] and

means for dividing ~~divides~~ the combined result by $(\alpha+1)$;

whereby to minimize the approximation error.

15. (Original) The system of claim 14, wherein α is greater than 0 and no greater than 1.

16. (Original) The system of claim 14, wherein α obtained for a corresponding respective N is selected so as to minimize a maximum approximation error.

17. (Currently Amended) An approximation system for a series expansion of an input function with a finite number of terms N to minimize an approximation error, said system including an operational processing unit, said operational processing unit comprising:

means for expanding ~~an operational processing unit which expands~~ the input function in Taylor series up to an (N-1)-th term to obtain an expansion result;~~, multiplies~~

means for multiplying an N-th term of the expansion result by a predetermined weight value to obtain a multiplication result;[[,]] and ~~combines~~

means for combining the expansion result and the multiplication result to obtain an approximation function *f* for the series expansion function;

whereby to minimize the approximation error.

18. (Original) The system of claim 17, wherein the predetermined weight value is

$\frac{(-1)^N}{(\alpha+1)}$ for $0<\alpha\leq 1$.

19. (Original) The system of claim 18, wherein α obtained for corresponding respective N is selected to minimize a maximum approximation error.

20. (Original) The system of claim 19, wherein α is obtained by:

(a) selecting a minimum input in a given input x area;

(b) calculating the approximation function f for the input function with the finite number of terms N

(c) obtaining and storing an error $E_{N,x}$ by subtracting approximation function f from a nominal function value of the input x;

(d) determining whether the input x has reached a maximum value in the given input x area, adding a predetermined increment ξ to x when x has not yet reached the maximum value, and repeating steps (b), (c) and (d);

(e) selecting a maximum error value among all the stored errors $E_{N,x}$ for all inputs when x has reached a maximum value; and

(f) searching α to minimize the maximum error value, and storing α as the weight value for a corresponding N.

Claim 21 (Canceled)

22. (Currently Amended) An orthogonal frequency division multiplexing (OFDM) system for compensating a carrier frequency offset, said system comprising:

an estimator for estimating the carrier frequency offset $\hat{e}$ by using a series expansion of a function arctan(x);

a first phase rotation calculator for using the estimated carrier frequency offset to obtain a phase rotation value for a first input sample of k=1, wherein $\sin(2\pi\hat{e})$ and $\cos(2\pi\hat{e})$ are series-expanded to minimize an approximation error;

a second phase rotation calculator for using a phase rotation value for a previous input sample including k=1 to obtain a phase rotation value for a subsequent input sample; and

a compensator for compensating the phase rotation values for all input samples, thereby compensating the carrier frequency offset.

23. (Original) The system of claim 22, wherein the estimated carrier frequency offset $\hat{e}$ is represented by $\hat{\varepsilon} = \frac{1}{2\pi}\arctan\left\{\frac{\sum_{i=1}^{L}\mathrm{Im}(y(-i)y^{*}(L-i))}{\sum_{i=1}^{L}\mathrm{Re}(y(-i)y^{*}(L-i))}\right\}$, where Re and Im

represent a real part and an imaginary part, respectively, of a complex number, y(i) represents an i-th received sample, L is a fast fourier transformation (FFT) size, and $\hat{e}$ is an estimated and normalized carrier frequency offset of $\Delta \hat{f} T$.

24. (Currently Amended) The ~~method~~ system of claim 23, wherein the phase rotation value for a k-th sample is calculated by:

$$For\quad k=1,\ \cos(\Delta\hat{\omega}T_s)=\sum_{n=0}^{N}(-1)^n\frac{\Delta\hat{\omega}T_s^{\ 2n}}{(2n)!}$$

$$\sin(\Delta\hat{\omega}T_s)=\sum_{n=0}^{N}(-1)^n\frac{\Delta\hat{\omega}T_s^{\ (2n+1)}}{(2n+1)!}$$

$$\begin{aligned}For\quad k\geq 2,\ \cos(k\Delta\hat{\omega}T_s)&=\cos((k-1)\Delta\hat{\omega}T_s+\Delta\hat{\omega}T_s)\\&=\cos((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s)-\sin((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s)\\\sin(k\Delta\hat{\omega}T_s)&=\sin((k-1)\Delta\hat{\omega}T_s+\Delta\hat{\omega}T_s)\\&=\sin((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s)+\cos((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s)\end{aligned}$$

25. (Currently Amended) The ~~method~~ system of claim 22, wherein the phase rotation value for a k-th sample is calculated by:

$$For\quad k=1,\quad \cos(\Delta\hat{\omega}T_s)=\sum_{n=0}^{N}(-1)^n\frac{\Delta\hat{\omega}T_s^{\,2n}}{(2n)!}$$

$$\sin(\Delta\hat{\omega}T_s)=\sum_{n=0}^{N}(-1)^n\frac{\Delta\hat{\omega}T_s^{\,(2n+1)}}{(2n+1)!}$$

$$\begin{aligned}For\quad k\geq 2,\quad \cos(k\Delta\hat{\omega}T_s)&=\cos((k-1)\Delta\hat{\omega}T_s+\Delta\hat{\omega}T_s)\\&=\cos((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s)-\sin((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s)\\ \sin(k\Delta\hat{\omega}T_s)&=\sin((k-1)\Delta\hat{\omega}T_s+\Delta\hat{\omega}T_s)\\&=\sin((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s)+\cos((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s)\end{aligned}$$

Claims 26-35 (Canceled)

36. (Currently Amended) The system of claim 14, wherein the operational processing unit further comprises:

means for using[[uses]] the approximation to obtain a phase rotation value for a first input sample of k=1, wherein $\sin(2\pi\hat{e})$ and $\cos(2\pi\hat{e})$ are series-expanded to minimize the approximation error;

means for using a phase rotation value for a previous input sample including k=1 to obtain a phase rotation value for a subsequent input sample; and

means for compensating the phase rotation values for all input samples.

37. (Previously Presented) The system of claim 36, wherein an estimated carrier frequency effect $\hat{\varepsilon}$ is represented by $\hat{\varepsilon} = \frac{1}{2\pi} \arctan \left\{ \frac{\sum_{i=1}^{L} \mathrm{Im}(y(-i) y^*(L-i))}{\sum_{i=1}^{L} \mathrm{Re}(y(-i) y^*(L-i))} \right\}$, where Re and Im represent a real part and an imaginary part, respectively, of a complex number, y(i) represents an i-th received sample, L is a fast fourier transformation (FFT) size, and $\hat{\varepsilon}$ is an estimated and normalized carrier frequency offset of $\Delta \hat{f} T$.

38. (Previously Presented) The system of claim 37, wherein the phase rotation value for a k-th sample is calculated by:

$$For \quad k = 1, \quad \cos(\Delta\hat{\omega}T_s) = \sum_{n=0}^{N} (-1)^n \frac{\Delta\hat{\omega}T_s^{\,2n}}{(2n)!}$$

$$\sin(\Delta\hat{\omega}T_s) = \sum_{n=0}^{N} (-1)^n \frac{\Delta\hat{\omega}T_s^{\,(2n+1)}}{(2n+1)!}$$

$$\begin{aligned} For \quad k \geq 2, \quad \cos(k\Delta\hat{\omega}T_s) &= \cos((k-1)\Delta\hat{\omega}T_s + \Delta\hat{\omega}T_s) \\ &= \cos((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s) - \sin((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s) \\ \sin(k\Delta\hat{\omega}T_s) &= \sin((k-1)\Delta\hat{\omega}T_s + \Delta\hat{\omega}T_s) \\ &= \sin((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s) + \cos((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s) \end{aligned}$$

39. (Currently Amended) The system of claim 17, said operational processing unit further comprising ~~the steps of~~:

means for using the approximation to obtain a phase rotation value for a first input sample of k=1, wherein $\sin(2\pi\hat{e})$ and $\cos(2\pi\hat{e})$ are series-expanded to minimize the approximation error;

means for using a phase rotation value for a previous input sample including k=1 to obtain a phase rotation value for a subsequent input sample; and

means for compensating the phase rotation values for all input samples.

40. (Previously Presented) The system of claim 39, wherein an estimated carrier frequency effect $\hat{e}$ is represented by $\hat{\varepsilon} = \frac{1}{2\pi}\arctan\left\{ \frac{\sum_{i=1}^{L} \mathrm{Im}(y(-i)y^{*}(L-i))}{\sum_{i=1}^{L} \mathrm{Re}(y(-i)y^{*}(L-i))} \right\}$, where Re and Im represent a real part and an imaginary part, respectively, of a complex number, y(i) represents an i-th received sample, L is a fast fourier transformation (FFT) size, and $\hat{\varepsilon}$ is an estimated and normalized carrier frequency offset of $\Delta\hat{f}T$.

41. (Previously Presented) The system of claim 40, wherein the phase rotation value for a k-th sample is calculated by:

$$For \quad k=1, \quad \cos(\Delta\hat{\omega}T_s)=\sum_{n=0}^{N}(-1)^n \frac{\Delta\hat{\omega}T_s^{\;2n}}{(2n)!}$$

$$\sin(\Delta\hat{\omega}T_s)=\sum_{n=0}^{N}(-1)^n \frac{\Delta\hat{\omega}T_s^{\;(2n+1)}}{(2n+1)!}$$

$$\begin{aligned} For \quad k\geq 2, \quad \cos(k\Delta\hat{\omega}T_s) &= \cos((k-1)\Delta\hat{\omega}T_s+\Delta\hat{\omega}T_s) \\ &= \cos((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s)-\sin((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s) \\ \sin(k\Delta\hat{\omega}T_s) &= \sin((k-1)\Delta\hat{\omega}T_s+\Delta\hat{\omega}T_s) \\ &= \sin((k-1)\Delta\hat{\omega}T_s)\cos(\Delta\hat{\omega}T_s)+\cos((k-1)\Delta\hat{\omega}T_s)\sin(\Delta\hat{\omega}T_s) \end{aligned}$$